

Abstracts in International Scientific Meetings

National occupational health research agenda, strategy and promotion in Japan

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27th International Congress on Occupational Health, Symposium Session, Abstract Book, p40.

The National Occupational Health (OH) Strategy Conference in Japan (First Conference) was organized by the Japanese Ministry of Labour in 1998-2001 with 53 Conference members. In 2001, the National OH Key Research Promotion Conference (Second Conference) was newly organized with the same members to promote the strategy identified by the First Conference classified 344 original research topics into 58 Research topics. Then, short-term (i.e., 0-5 year) and long-term (6-10 year) priority scores of the all Research topics were calculated according to their general, short-term and long-term selection criteria. Then overall priority scores were calculated by combining the short-term and long-term priority scores. The Priority topics were also selected by 241 External specialists. The Second Conference has made 1-year efforts to promote the National strategy. (1) The ranking of the overall priority scores selected by Conference members was as follows [the ranking by External specialists in parentheses]: 1st, Occupational stress (Occupational stress and Mental health); 2nd, Elderly worker(None); and 3rd, Woman worker (Elderly worker); (2) Based on the priority scores, all 58 Research topics were classified into 18 Priority research issues in 3 Key research areas; 8 implementation and promotion measures of the National strategy were concluded with the Ministry of Labour. (3) The First-year activities of the Second Conference were as follows: (a) Dissemination of the National strategy. (b) Investigation of study reports on 18 priority research issues, (c) National symposium, and (d) Publication of review and original articles in the Key research areas. It is anticipated that promotion of the National strategy would greatly enhance OH research and practice in Japan.

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Study on the SCV of the radial nerve in the index finger

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OBJECTIVES: Conventional sensory conduction velocity (SCV) test in the radial nerve was limited to the cutaneous radial nerve on the tendon of extensor pollicis longus muscle (TPLEM point) stimulated at the forearm. We developed the SCV of the radial nerve in the index finger as a new technique in the research and examine the usability of the method. **SUBJECTS AND METHODS: Subjects** were 7 patients with musculoskeletal disease (MSD) in the upper arm, 8 workers with relatively severe symptoms of MSD, and 8 healthy controls. **Methods** were as follows: Electric stimulation was given at the distal part of the forearm (fo, about 10 cm proximal from the recording point of the dorsal side of the hand) or TPLEM point, and sensory nerve action potential (S-NAP) was antidromically recorded at the base of the index finger (BF) and 3cm distant from BF point (F). The finger SCV in the radial nerve was BF-F sections. S-NAP was recorded through half cut width disposable ring electrodes (Nicolet Biomedical, USA). The SCV measured was corrected for SCV at 33 °C of the standard skin temperature using de Jesus's method. **Statistical analysis** was done by comparison of SCV and amplitude of S-NAP of the patients and the controls using Student's *t*-test, and by ANOVA of SCV and S-NAP between controls, subclinical and patients group. **RESULTS:** SCV in the index fingers of the 3 groups were 39.0 ±3.71 m/s (patients), 50.6 ±13.6 m/s (subclinical group) and 57.0 ±6.30 m/s (control group). Significant ANOVA test was found in the finger SCV (dF=2, 25, F=7.13, p=0.0340) without significant multiple comparison. Coefficient of variation of the index finger SCV in the control group was 11.1%. **CONCLUSION:** The present results suggest the usability of the method.

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Effects of perinatal exposure to bisphenol A on the brain monoamine contents of rats.

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The 9th Meeting of the International Neurotoxicology Association., Abstract Book p53, 2003.

Bisphenol A (BPA) is widely used as stabilizer of plastics and has been reported to mimic the actions of estrogen or to affect the endocrine glands in vivo and in vitro. Low dose effects and inverted U-shaped dose-effect relationship are argued about BPA. Effects of BPA on the second generation are also important issues. In this study, we investigated whether exposure to BPA through placenta and milk has any effect on the offspring of rats. BPA at 4, 40, and 400 mg/kg was orally dosed to pregnant rats, Sprague-Dawley (Crj: CD (SD) IGS), from gestation days 6 to postnatal day 20. Neuroactive substances were extracted from the brain and measured in liquid chromatography equipped with an electrochemical detector. At 1 week after birth, brain substances were measured in whole brain, and serotonin and its metabolite 5HIAA (5-hydroxyindoleacetic acid) decreased almost dose-dependently. At the age of 3 weeks, cerebellum and medulla oblongata were removed from the whole brain and residual brain was divided into fore- and hindbrain. Dopamine and its metabolite DOPAC (3,4-dihydroxyphenyl acetic acid) in the medulla oblongata of male rats decreased in a dose-dependent manner. A tendency of decrease in serotonin and 5HIAA was observed in fore- and hindbrain of 40mg/kg group. Thus, perinatal exposure to BPA has elicited changes in monoamine neurotransmitters in the brain of offspring. These results suggest the possibility that an emotional change may have occurred in offspring of 40mg/kg group.

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Pituitary-thyroid axis in the postnatal rat offspring following gestational and lactational exposure to Bisphenol A

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Bisphenol A (BPA), a xenoestrogen, is very widely used in the manufacture of polycarbonate and epoxy resins. Although BPA has been reported to mimic the actions of estrogen or to affect the reproductive organs and accessory genital glands, the effects of maternal exposure to BPA on the offspring of rats still remain unclear. In the present study, we examined whether gestational and lactational exposure to BPA altered the postnatal growth and thyroid function of male and female offspring in vivo in rats. Pregnant Sprague-Dawley rats were exposed to BPA (0, 4, or 40 mg/kg/day) in corn oil once daily via oral gavage from gestation day 6 through postnatal day 20, and the control group was given the same amount of corn oil during the same period. There were no significant changes in body weight, liver weight, kidneys weight, testes weight (male), anogenital distance (AGD), or AGD indices in the BPA-exposed groups compared to the control group. Plasma concentrations of thyroid hormone (T4) and thyroid-stimulating hormone (TSH) were unaffected. No differences in the plasma T4 response to exogenous TSH stimulation occurred in all exposed groups compared to the control group. These results suggest that BPA did not produce any severe impairment in the postnatal growth and pituitary-thyroid axis of the F1 generation in rats under the present experimental conditions wherein the exposure levels were relatively high. The effects of BPA exposure are, however, still incompletely understood and further study should be carried out to confirm the toxicity of BPA during gestational and lactational period in rats.

National Institute of Industrial Health

Occupational mental health : Early notice of the employees who are at the risk of depression

Lumie Kurabayashi

Plenary session. NIOSH 6th National Conference and Exhibition on Occupational Safety and Health, Book of Abstract, p12. 2003.

Occupational mental health (OMH) is now attracting a great deal of attention. As we see the changing pattern of the employment system, down-sizing and the industrial technological revolution, the number of employees who suffer from the psychological stress of their work (63% in Japan in 1997) and middle aged and older men who commit suicide has increased remarkably. Health management staff of the greater part of companies said that the employees who suffered mental disorders like depression have increased in recent years. The labor loss and medical cost due to these mental disorders cannot be neglected. OMH care has become important not only from the standpoint of the welfare for employees, but also from that of risk management and cost benefit. The Ministry of Labour in Japan issued the guidelines on OMH in 2000 which consist of four means of preventive management ; 1)self care, 2)care by managers, 3)care by health care staff in a company and 4)care by service resources outside of a company. To support self care by employees themselves and care by managers, OMH staff and health services both inside and outside of a company are necessary. Training programs for employees and managers are important in mental health management. For managers, early notice of their subordinates who are at the risk of suffering from depression or other mental disorders is also important. Depression is one of the most important mental disorders in workplace. Early notice or early discovery could lead to early recovery. This article also mentions how to notice employees at the risk of depression.

National Institute of Industrial Health

A desirable care for workers suffering from depression/other mental disorders in workplace

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Mini symposium. NIOSH 6th National Conference and Exhibition on Occupational Safety and Health, Book of Abstract, p22. 2003.

The Ministry of Labour in Japan issued the guideline for mental health promotion for employees in 2000. It recommended four types of mental health care in workplace. They are 1) self-care, 2) care by managers, 3) care by professional health care staff in a company and 4) care by service resources outside of a company. Of these four, care by managers is as important as self-care, especially for small-sized companies which cannot afford professional health care staff inside of them. According to the guideline, care by managers consists of two roles. One is the improvement of working environment to promote more comfortable workplace. The other is care for each employee. The latter includes early notice of the employees who are at the risk of depression in workplace, which I am going to introduce in my speech in the morning program. In this session, if time allows, one of the tools for training programs for managers will be introduced. This tool is to show managers how to take care of employees who are at the risk of suffering from depression or other mental disorders in workplace.

National Institute of Industrial Health

The psychosocial factors co-related with the need for mental health counseling services among Japanese expatriates in Duesseldorf and in Ho Chi Minh City

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27th International Conference of Occupational Health, Abstract (CD-ROM), 2003.

1) Aims : The purpose of this study is to clarify what kind of demographic or psychosocial factors have on the relationship with the need for mental health counseling services among the Japanese expatriates in Duesseldorf in Germany and in Ho Chi Minh City in Viet Nam. 2) Subjects and Methods : At the end of 2000, we administered a questionnaire containing GHQ-12 to 612 expatriates in Duesseldorf and 106 expatriates in Ho Chi Minh City. All were Japanese male employees working in Japanese or Japanese subsidiary companies. 3) Results: 44.5 % of the subject in Duesseldorf and 40.4% of that in Ho Chi Minh City expressed their desire to have counseling services in Japanese. Those who seek these services had significantly higher scores in GHQ-12, which means more psychological symptoms, than those who need not have these services in Duesseldorf. In Ho Chi Minh City, those who seek these services had stayed abroad significantly shorter than those who need not. 4) Conclusions : Due to the difference in the background of Duesseldorf and Ho Chi Minh City, it is not easy to compare and assess the need for mental health services in both cities, where there is no counseling services in Japanese now. To improve mental health among expatriates, we have to make use of mental health services both in Japan and with local resources.

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Thermal loads of workers in Japanese cold environments and their need for rational choice of cold protective clothing

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Abstract of 27th International Congress on Occupational Health, Iguassu Falls, Brazil, February 23-28, 2003.

Aims: There are many cold workplaces in Japan such as outdoor works in winter, refrigerated warehouses and food industries. However, limited information is available regarding the thermal loads of the workers and the effectiveness of countermeasures for cold stress during work. This study aims to investigate how long the workers are exposed to cold stress, how much they are cooled, what kind of cold protective clothing they are using and how effective their clothing is for cold protection during work in these cold work environments in Japan. **Methods:** The field surveys were carried out of an outdoor telecommunication construction work in winter, three refrigerated warehouses works and a food industry work in Japan. To estimate how long the workers are exposed to cold stress and how much they are cooled, skin temperature of peripheral parts of the body, body core temperature and ambient temperature of the vicinity of the workers were continuously measured for some of the workers during work. The thermal insulation of cold protective clothing used by the workers was determined by the moving thermal manikin TORE (National Institute for Working Life, Stockholm) and the result was used as input in the international cold standard (ISO/TR-11079) to assess whether their cold protective clothing is suitable for their cold work condition. **Results:** (1) Long-sustained work with short break was observed in every workplace. Intermittent and frequent cold exposure was also observed in the refrigerated warehouse work. (2) Excessive peripheral and body core cooling without perception was found in many of the refrigerated warehouse and telecommunication construction workers. Excessive peripheral cooling was found in some of the food industry workers. (3) Empirical choice of cold protective equipment was taken in every workplace. (4) The assessment by the thermal manikin and ISO/TR-11079 suggested that the thermal insulation of cold protective clothing used by the refrigerated warehouse and telecommunication construction workers is liable to become insufficient for cold protection during work. It also suggested that the cold protective clothing used by the food industry workers is sufficient for protection against whole body cooling but not against peripheral cooling.

Conclusion: A rational choice of cold protective equipment that is not dependent on workers' subjective and empirical judgment is essential to prevent the excessive body cooling and cold injuries at work.

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Comparison of the prevalence of premature beats with 24-hour Holter electrocardiography in shift workers in a manufacturing company

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(Objective) The object is to assess whether there are differences in the prevalence of premature beats between normotensive and hypertensive shift workers and between dayshift and night shift with the use of 24-hour Holter ECGs. (Methods) First, 9 hypertensive and 11 normotensive shift workers were fitted with 24-hour Holter ECG monitors and comparisons were made between the prevalence and types of premature beats encountered among 20 shift workers. Second, We investigated differences in the prevalence of premature beats between day shift and night shift for 7 among 20 shift workers. (Results) The prevalence of isolated supraventricular premature beats (SVPB) and SVPB runs were higher in the hypertensive shift workers than in the normotensive shift workers, but without statistical significance. Among 7 shift workers, one had more ventricular premature beats in night shift than that in dayshift. (Conclusion) This study was a preliminary investigation in shift workers to clarify the differences in the prevalence of premature beats with the use of 24-hour Holter ECGs. The results suggested the necessity of a larger scale study to clarify an association between shift work and the prevalence of premature beats.

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Elevated daytime sleepiness in day and shift workers experiencing stress at work

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Daytime sleepiness may be seen as a sign of how workers cope with their working conditions. We know that working shifts affects the level of sleepiness considerably. Yet, what remains unclear is the role of job stress in daytime sleepiness. This study investigated whether daytime sleepiness would be varied as a function of stress at work for day and shift workers. Participants included 828 day workers (male 386, mean age 43 years; female 442, 35 years) and 205 male shift workers (39 years). They completed a self-administered questionnaire asking job stress, stress responses (job satisfaction and depressive symptoms), sleep habits, daytime sleepiness (Epworth Sleepiness Scale, ESS), and lifestyle factors. The scales of job stress and stress responses were derived from the Japanese version of the US NIOSH generic job stress questionnaire. The scale scores for job stress and stress responses were divided into four groups with quartile points. An analysis of covariance (ANCOVA) with age, sex (only for day workers' data), other factors (lifestyle, comorbidity, insomnia, sleep duration, work hours) as covariates showed significantly higher ESS scores of day workers by greater quantitative workload, greater variance in workload, higher job dissatisfaction, and more depressive symptoms. For shift workers, significantly higher ESS scores were found with higher job dissatisfaction and more depressive symptoms. The results indicate the build-up of daytime sleepiness among day workers who experience high workload, its large variance, job dissatisfaction, and depressive symptoms. Also, daytime sleepiness may be elevated among shift workers when they have job dissatisfaction and depressive symptoms. Our findings suggest that those occupational factors should be addressed in managing workers' sleepiness.

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The relationship between vibratory sensation and body surface vibration induced by complex low-frequency noise composed of two pure tones

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The 32nd International Congress and Exposition on Noise Control Engineering (Inter-Noise 2003), Abstracts, p2776-2782, 2003.

We examined the relationship between vibratory sensation and body surface vibrations induced by complex low-frequency noise composed of two pure tones. It was found that at the chest and abdomen, the rating of vibratory sensation was significantly correlated with the power summation of two vibration acceleration levels each of which corresponded to a pure tonal component in the complex noise stimulus. Because no frequency-weighting was applied in calculating the power summation, these results were consistent with our previous results indicating that the rating of vibratory sensation induced by low-frequency pure tones is closely correlated with the vibration acceleration levels on the body surface, regardless of the frequency of the pure tonal stimulus. The results of the present study suggest that the vibratory sensation induced by complex low-frequency noise is closely related to the mechanical vibrations induced on the body surface.

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An ELISA assay to measure urinary 8-hydroxydeoxyguanosine was effective in epidemiological study

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Molecular and Genetic Epidemiology of Cancer (An AACR International Conference in Cancer Research), Book of Abstracts, poster presentations A4.

Since the commercial ELISA kit using anti-8-OHdG monoclonal antibody N45.1 has been improved, we compared the urinary 8-OHdG values measured by the ELISA with the values obtained by HPLC-ECD. We sampled urine of 72 healthy Japanese and measured their urinary 8-OHdG levels by the ELISA with appropriate controls and by HPLC-ECD. When X was defined as the values of 8-OHdG measured by HPLC-ECD and Y as the values of 8-OHdG measured by the ELISA, simple regression analysis showed the

most likely relationship to be $Y = 1.83 X + 0.8$. The correlation coefficient was 0.88, which indicated a good correlation between X and Y. These results show that the ELISA assay can be applied to studies comparing relative urinary 8-OHdG values among several groups, if the studies do not require determination of the exact concentration of 8-OHdG in urine. We then applied this method in assessing urinary 8-OHdG of municipal solid waste incinerator (MSWI) workers. The subjects were 81 male workers (mean age 42.7) from four MSWIs in the same city. Written informed consents were given from all subjects. Occupational health doctors interviewed each subject about his job history, evaluated the exposure to fly ash, and calculated its total duration. The subjects were classified into four groups; those were Long duration of exposure to fly ash, Short duration of exposure to fly ash, Limited exposure to fly ash, and Control. Blood and urine specimens were obtained from subjects in the morning. The levels of 8-OHdG in urine and in leukocytes were measured as oxidative DNA damage markers. The tendency that the level of urinary 8-OHdG elevated with the increased duration of exposure to MSWI fly ash was significant. Our result showed that exposure to fly ash increased the excretion of urinary 8-OHdG depending to the exposure duration.

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Effects of pH on force and stiffness of slow and fast muscle fibers

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Aims: Musculoskeletal disorders (MSD) account for the largest part of occupational diseases. In order to understand muscle contraction characteristics, we investigated force and stiffness of skinned rabbit slow and fast muscle fibers under different pH conditions. 2) Methods: Skinned muscle fibers were made from the psoas and soleus muscles of female Japanese White Rabbit, aged from 8 to 10 weeks. Ends of single muscle fiber were glued to a rod from a force transducer and a rod from rapid motor. The motor oscillated sinusoidally at 500 Hz to get muscle stiffness. The signals from force transducer were amplified by a DC amplifier and stored in a personal computer. A skinned muscle fiber was at first soaked in relaxing solution, transferred to contracting solution containing 4mM Ca²⁺, and then returned to relaxing solution. The force and stiffness of muscle fiber were measured at three pH conditions (6.0, 6.5 and 7.0) for each three different temperatures. 3) Results: It was observed that the maximum force and stiffness declined as pH decreased, the extent of which was diminished by elevation of temperature in both muscle types. Low temperature also reduced maximum force and stiffness of skeletal muscle. As pH of contracting solution decreased, the time to peak stiffness increased and the time to relaxation decreased in both muscle types. 4) Conclusions: If decreasing rate of force at pH 6.5 could be extrapolated to higher temperature, there would be little force decrease at body temperature. Shortening of time to maximum stiffness and extending of time to relaxation at low pH could hurt muscle when one muscle contracts and the other antagonistic muscle relaxes at the same time. One of causes of muscle damage at low pH could be supposed to be decrease of time to maximum stiffness and increase of time to relaxation.

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Effect of 2-ethoxyethanol on spermatogenesis in the exposed workers

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41st Congress of the European Societies of Toxicology, Toxicol Letters 144, s111.

2-Ethoxyethanol (ethylene glycol monoethyl ether) is a common solvent used in industry and in consumer goods. This compound has been known to have toxic effects on testes and blood system in a number of species, causing oligospermia as well as some hematological abnormalities. In this study, we investigated the toxic effects of 2-ethoxyethanol exposure among the male workers in two factories manufacturing the photopolymer sensitization plate in Beijing. Some workers were exposed to high levels of ambient 2-ethoxyethanol, and others were working in places with very low level or no detectable concentration of the solvent and served as the comparison group in this study. The urinary metabolite of the compound, ethoxyacetic acid, was measured, and it was much higher in those with high level exposure than in the comparison group. Semen samples were collected from some of the workers, and sperm analyses showed that sperm count, progressive motility and percentage of sperms with normal morphology were significantly lower in the exposure group than in the comparison group. In some subjects with high level exposure, the values were out of the normal range. On the

other hand, the mean concentrations of sex-related hormones in blood, testosterone, LH, FSH, prolactin and estradiol, were at the same extent in both groups. Hematological examinations showed that the red blood cell count, hemoglobin level, packed cell volume as well as white blood cell count were all lower in the group of exposure. No difference was found in platelet count between the two groups. Liver function was not found to be damaged in the exposed subjects. The SNPs of aldehyde dehydrogenase 2 were analyzed, and its effects on the metabolism and toxicity expression of 2-ethoxyethanol were demonstrated.

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Reliability of the level of urinary 8-hydroxy-2'-deoxyguanosine (8-OHdG) and its usefulness for epidemiological studies

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41th Congress of the European Societies of Toxicology (EUROTOX 2003), *Toxicology Letters* 144(Suppl. 1),s117, 2003.

Measurement of urinary 8-OHdG has recently become more popular as a means of assessing oxidative stress level in the human. In this study we evaluated the reliability of urinary 8-OHdG as a biomarker for assessing the level of oxidative stress and the usefulness in epidemiological studies. To assess the reliability, samples were taken from 12 volunteers 4 times at one-hour interval and also taken from 70 volunteers 3 times at one-year interval from year 2000 to 2002. Urinary 8-OHdG levels were measured by HPLC-ECD method. Serum MDA, LPO measurements and blood chemistry tests were also performed for comparison. There was no difference in urinary 8-OHdG levels of each volunteer during 3 hours duration (P = 0.1). Correlation coefficient of the urinary 8-OHdG between 2000 and 2001 was 0.8, which was quite high compared with 0.17 of serum MDA and 0.53 of serum LPO. Considering from the view point of stability of the measurement, these results show that the level of urinary 8-OHdG is possibly more reliable oxidative stress marker than serum MDA or serum LPO. To assess the usefulness in epidemiological studies, we examined whether smoking affect the level of urinary 8-OHdG. Although there was no significant difference in cigarette number between smoker of 2000 and 2001, the mean level of urinary 8-OHdG in smokers (4.09) was significantly higher than that of non-smokers (3.25) in 2000 (P<0.05). There was also similar difference in the mean levels of urinary 8-OHdG between smokers and non-smokers in 2001. Considering all these results, the level of urinary 8-OHdG is probably one of the best oxidative stress markers when used at epidemiological studies.

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Associations between oxidative stress levels and total duration of engagement in jobs with exposure to fly ash among workers at municipal solid waste incinerators

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The fly ash from municipal solid waste incinerators (MSWIs) is known to contain heavy metals, polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), polyaromatic hydrocarbons (PAHs), and other organic materials. Heavy metals, PCDDs, PCDFs, and PAHs reportedly cause oxidative stress in vitro and in vivo. In this study, we measured the blood and urinary levels of several oxidative stress markers in MSWI workers, and discuss herein whether the duration of engagement in jobs with exposure to MSWI fly ash is associated with these levels. The subjects were 81 male workers (mean age 42.7) from four MSWIs in the same city. Job history was interviewed from each subject and jobs were categorized according to the possibilities of exposure to fly ash. The subjects were classified into four groups; long duration of engagement in jobs with exposure to fly ash, short duration of engagement in jobs with exposure to fly ash, engagement in jobs with limited exposure to fly ash, and control. Blood and urine specimens were obtained from the subjects in the morning before breakfast. The levels of 8-hydroxy-2'-deoxyguanosine in the urine and leukocytes were measured as markers of oxidative DNA damage. Blood malondialdehyde and lipid peroxide levels, and total urinary biopyrrins level were also measured as markers of systemic oxidative stress. The mean levels of all markers were compared among the four groups.

There was a significant trend showing that the level of urinary 8-OH-dG rose with increased duration of engagement in jobs with exposure to MSWI fly ash ($P < 0.05$). Considering this result, we speculated that certain chemicals in fly ash might have induced oxidative stress in the study subjects.

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